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HENRY LING TAYLOR, M.D.,

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Reprinted from THE MEDICAL RECORD, April 26, 1884.



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PRIMARY CRURAL ASYMMETRY.

THERE is a natural equilibrium between the two great and opposing biological forces, namely, the centripetal one of heredity, tending to preserve the type, and the centrifugal one of variation, tending to modify it. In studying the evolution of the human form we find that civilization and refinement come in as disturbing factors, favoring variation.

It has long been known that the human form is not strictly bilaterally symmetrical. We are right- or left-handed, *i.e.*, the right or left side of the body is more powerful, more skilful and larger than the other. Photographers and portrait painters accept the fact that the lateral halves of the face differ in form and expression, and pose their subjects accordingly. I have somewhere seen curious statistics concerning the relative lengths of the index and ring fingers on the two hands, showing that in some persons the index fingers were longer, in others the ring fingers, while many had a longer index finger on one hand and a longer ring finger on the other. The examination of a few hands will show any one that there is no uniformity about it. A gentleman to whom I spoke of this subject, gave a singular illustration on his own person. He said he had always been annoyed in wearing spectacles by the circumstance that one of his ears was so much higher than its mate that the frame never rested evenly on his nose.

Although these or similar facts have long been known, the medical profession was quite taken by surprise when

it was announced, a few years ago, that it was not very uncommon for persons, not the subjects of disease or injury, to have lower extremities of unequal length.

This discovery was made by some of the surgeons of the Pennsylvania Hospital while studying paradoxical results in the measurement of limbs after fractures of the femur.¹

The fact has been known and recognized in the treatment of cases by Dr. C. Fayette Taylor (from whose practice I shall draw my illustrations) for about fifteen years,² having been observed by him independently of its discovery by others, and while studying quite a different class of cases, namely, those of lateral curvature.

Before going further, I wish to emphasize the fact that, far from being a simple matter, the accurate measurement of the extremities, even where there is free joint motion, is extremely difficult. Sufficient proof of this is afforded by the frequent instances of wide differences in the results obtained by even eminent surgeons in the measurement of the same case, and I could adduce curious and striking examples of this, if it were worth the while.

In undertaking to measure the lower extremities of a recumbent person, the first object must be to level the pelvis. We must see that a line joining the anterior spines of the ilia cuts the median plane of the body at right angles, and this relation must be preserved while the measurement is being made. Merely to drag down by the feet and observe whether the soles are on a level, gives one no information whatever. It follows that an assistant to hold the pelvis straight is desirable, if this

¹ See articles by Dr. Wm. C. Cox, Am. Jour. of the Med. Sci., April, 1875, p. 438; Dr. Jarvis S. Wight, Archives of Clinical Surgery, February, 1877, p. 283, and Proceedings of the Medical Society of Kings County, N. Y., January 21, 1878; Dr. Wm. Hunt, Am. Jour. of the Med. Sci., January, 1879, p. 102; Dr. Thomas G. Morton, Surgery in the Pennsylvania Hospital, 1880; Dr. J. B. Roberts, Philadelphia Medical Times, August 3, 1878.

² Dr. T. M. L. Chrystie remembers a particular case of this kind in Dr. Taylor's practice, which came before 1873, and the trouble was then recognized. Dr. Chrystie says other cases were seen in Dr. Taylor's office before that.

method be employed. The tape for many reasons is not satisfactory, even when proper precautions are taken, and a number of instruments have been devised to take its place.¹

No instrument, however, can obviate the main difficulty, namely, the absence of definite corresponding points between which to measure. Sir James Paget, with his usual good sense, writes in a letter to Dr. Wm. Hunt, dated February 5, 1875: "I very rarely use measuring tapes or anything but the eye. The eye is surely more exact."²

Dr. Taylor has employed for many years the following method, which is at least as accurate as any other, and perfectly easy to apply. The patient, barefooted and with the hips exposed, stands with his back to the examiner. Care is taken that the heels are near together and the knees straight. If, after careful inspection of the contour of the hips and loins, which alone will nearly always reveal the presence or absence of crural asymmetry to the trained eye, while the patient stands upright, the edges of two equally thick rules, or the radial edges of the flatly extended hands, are pressed into the flanks just above and, guided by the iliac crests, any difference in their level will be easily appreciated. If there be a difference, its amount may be determined by placing increasing thicknesses of thin pamphlets, or similar objects, under the foot of the short side, until the two hands of the examiner, pressed over the iliac crests, are on a level. Now, if the thickness of the pamphlets be measured, we shall have quite an accurate notion of the amount of shortening. This method presupposes that the acetabula and ilia are vertically symmetrical, and I believe that they approximate nearly enough to this standard not to invalidate results obtained in this way,

¹ Vide THE MEDICAL RECORD, August 6, 1881, Dr. T. H. Howgate; Am. Jour. of the Med. Sci., January, 1877, Dr. Stacy B. Collins; Lancet, April 27, 1878, Charles Roberts, F.R.C.S.

² Vide paper by Dr. Hunt, Am. Jour. of the Med. Sci., January, 1879.

and, at any rate, the amount of pelvic obliquity is the really important point to be ascertained. This method is not equally applicable in all cases, but it is simple, convenient, and sufficiently accurate for the cases uncomplicated by joint troubles or paralysis, which we are now considering.

The measurements which I shall now proceed to give were mostly found by this plan, though some were obtained with the tape in the usual way, and in a few cases both methods were employed. I, myself, have seen and measured a good proportion of the cases given, the others are taken from notes scattered over the last six years. The notes were not systematically taken, and the cases given do not include a great many seen where no note was kept. Many of the cases have been under observation for several years, and have been repeatedly measured. A dozen or more have been photographed, and here the lateral tilting of the pelvis is easily apparent, and also the improvement of the form when the pelvis is horizontalized. I have taken no account of differences of a fourth of an inch or less. The cases have been drawn from all parts of the United States and Canada, and represent the well-to-do class.

As will be seen by the table this study has been mainly directed to young people (mostly girls) in the growing period. Of the thirty cases whose ages are known, all but three are under twenty years of age, and of the entire number all but six are females.

The left leg was shorter in twenty-eight cases, the right in four. This is a very striking result, and one directly opposed to the experiences of others.¹ It will have a bearing in the discussion later on.

¹ Dr. Frank Hamilton found the left limb longer in most cases (letter to Dr. Wight). Proceedings Medical Society County Kings, quoted in the Lancet, April 6, 1878, page 506.

Mr. Charles Roberts, in the Lancet for April 27, 1878, says: "The limb possessed of least muscular development will be found the longer of the two."

Drs. Cox, Wight, and Morton (*loc. cit.*) found the shortening on the right side in the majority of their cases. These results were obtained in males, and all but Dr. Morton's mostly in adults.

No.	Sex,	Age.	Short leg.	Inches shortening.	No.	Sex,	Age.	Short leg.	Inches shortening.
1	F.	11	L.		17	F.	14	L.	
2	F.	4	L.		18	F.	11	L.	
3	F.	12	L.		19	F.	11	L.	
4	M.	..	R.	1 $\frac{1}{4}$	20	M.	9	L.	
5	F.	14	R.	..	21	M.	16	L.	1
6	F.	13	L.	..	22	F.	15	L.	1
7	F.	12	R.	..	23	F.	15	L.	1
8	F.	16	L.	..	24	F.	8	L.	1
9	F.	17	I..	..	25	M.	8	L.	1
10	F.	13	L.	..	26	F.	18	L.	1
11	F.	7	L.	..	27	F.	12	L.	1
12	F.	15	L.	..	28	F.	60	R.	1
13	M.	5	I..	..	29	F.	13	L.	1
14	F.	14	I..	..	30	F.	30	L.	1
15	F.	..	L.	..	31	M.	43	L.	1
16	F.	13	L.	..	32	F.	8	L.	1

[Since compiling the above table, two months ago, I have seen two cases of primary crural asymmetry in females of sixteen and twenty-five years of age. The left leg was half an inch shorter in the former and an inch and a quarter in the latter.]

Another striking result is the large size of the difference found in most cases. It is not a question of eighths or fourths of an inch; in sixteen cases the difference is over half an inch, and in six it is an inch or more.¹

Crural asymmetry does not seem to depend on the rate of bodily growth. Some of the patients tabulated had grown rapidly, others slowly, while many had devel-

¹ Out of 637 cases reported by Drs. Cox, Wight, and Morton, there was asymmetry in 370 cases, but this amounted to more than half an inch in only twenty-eight cases.

oped at about the average rate. No. 21, a young man of sixteen, whose left leg is an inch shorter than its mate, rather more than less, is only fifty-eight inches tall. The majority of these children compare well with others of their age and circumstances, in respect to general health and development. Many of them, however, have imperfect and asymmetrical chests, partly due, in many cases, to changes secondary to pelvic lateral obliquity. Out of a few measurements made, I have found a difference in the length of the arms, measured from the tip of the acromion process to the end of the middle finger, in two cases. In Case 12, the left arm was $\frac{5}{8}$ inch shorter than the right, and the mother had noticed that in fitting dresses for her daughter she had always been obliged to shorten the left sleeve. In Case 13, the right arm was found to be $\frac{3}{8}$ inch shorter than its mate, though the left leg was the shorter.

Accurate measurements of the length of the arms are even more difficult than those of the legs, which is the less to be regretted, as moderate inequality in the lengths of the upper extremities is of no practical importance. I have noticed that in a few of these cases there seemed to be a general ill-development. The chest and loins were asymmetrical and the former flat or narrow (I am not now speaking of the effect of secondary lateral curvature), the whole form devoid of grace of line and movement, and the circulation poor, as shown by cold feet and hands, bluish skin, and "goose-flesh." These were apt to have particularly intellectual parents.

How do these cases come under the notice of the practical physician? What do they come for? In most instances the parents' attention is attracted by some of the evidences of a lateral spinal bending, due to the pelvic obliquity. It is a drooping or bulging shoulder, a peculiar attitude of the body or head, or an abnormally curved spinal column that leads the patient's friends to seek a physician's advice.

In other cases it is a peculiar or awkward gait, or an

undue tendency to stand on one leg. In Case 30, a single lady of thirty, the simple question was, "Why do I tire so easily in walking?" The $1\frac{1}{2}$ inch difference in the lengths of the lower extremities found answered the question. It is not easy to walk constantly along a side hill. In spite of this considerable difference this lady had no lateral curvature.

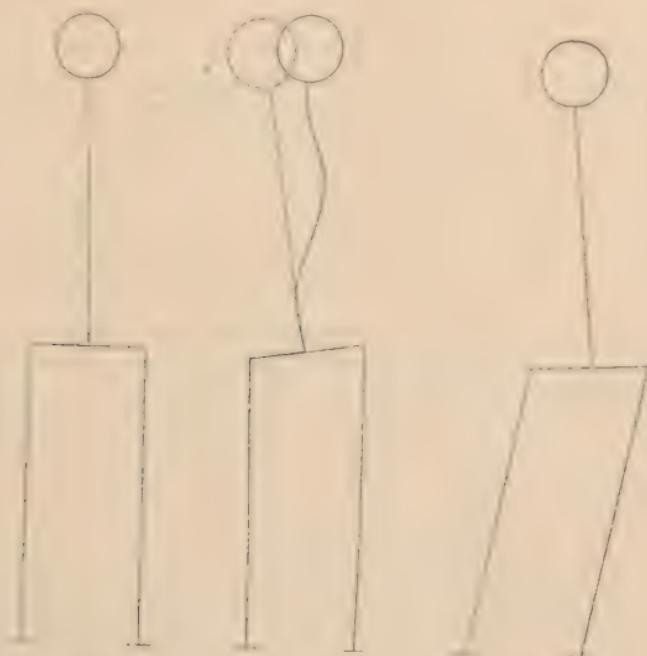


FIG. 1.

FIG. 2.

FIG. 3.

This brings us to the practical core of the matter. Crural asymmetry is chiefly important from the pelvic obliquity which it necessitates, giving as it does a strong bias in the growing period, when there is increased flexibility of the spinal column, toward a lateral curvature. I say a "bias," because if the spinal column and muscles be exceptionally strong this tendency will be resisted,

and the patient once tided over the vulnerable period—pubescence—the danger is over. The preceding figures (1, 2) show how a lateral curvature must ensue with an oblique pelvis, from the instinctive tendency to carry the head over the centre of gravity. Now, whether this slight bending shall go on increasing, necessitating rotation and a permanent curvature, will depend on the individual susceptibility to such a bias. As a matter of fact, in nearly one half of the cases there was no permanent curvature. In a few cases the pelvic slant is diminished by carrying the pelvis toward the long side (Fig. 3), which, as it necessitates the carrying of the head and shoulders toward the opposite side, to preserve the equilibrium, enables the patient to stand and walk with a straight back. The following case walked and stood in the manner described : No. 31, aged forty-three, the father of a little patient under Dr. C. Fayette Taylor's care for hip disease. While Dr. Taylor was examining the little girl one day, she suddenly exclaimed to her father, a large, well-developed man, "Why, papa, you are not straight either!" On looking at the gentleman Dr. Taylor detected pelvic obliquity, and on examination discovered an inch difference, yet there was no lateral curvature and the gentleman had been entirely unaware of his abnormality.

Pelvic obliquity, however, in the vulnerable period is a threat against the symmetry of the spinal column, and is to be diligently guarded against. The simple remedy is to place sufficient extra sole under the shoe of the short side to level the pelvis. In cases taken early, before there is any permanent curvature, *i.e.*, when the spine can be as easily bent and rotated in one direction as the other, levelling the pelvis until growth is attained is often sufficient to prevent deformity, though not always so, as children with horizontal pelvises may acquire lateral curvature. When a permanent curvature is already present, levelling the pelvis should be only accessory to mechanical means, and is never in itself sufficient.

After the patient has attained her growth, the danger of lateral curvature is passed and the high sole may be discarded, unless, from excessive difference in the length of the limbs or from a susceptible nervous system, the unnatural walking be too great a tax on the strength.

There is a common and ignorant prejudice, that the wearing of a high sole will tend to make the leg still shorter. It is hardly necessary to observe that the leg cannot be driven into the body like a pin into a potato, and it is hardly reasonable to suppose that a procedure which, by restoring pelvic horizontalism, puts the muscles into their proper relations and permits of the leg being used to the greatest advantage, would involve a retardation of growth. But what is more to the purpose, I can adduce an instance of the contrary effect.

Case 3 came at twelve, with a difference of over three-fourths inch. She wore the high sole for a considerable time. At seventeen years of age the difference had so diminished as to be barely perceptible. Similar instances have been observed. Secondary crural asymmetry due to joint or bone disease, or paralytic retardation of growth, of course, involves pelvic obliquity and its accompanying dangers. Many of the points made above apply with equal force in these cases.

In concluding, I must urge the importance of determining the presence or absence of pelvic obliquity as a necessary preliminary to the treatment of every case of lateral curvature of the spine.

There is an almost uninterrupted procession of these cases coming to our office, who are wearing or have worn plaster jackets or mechanical appliances to straighten the spine, when the attempt was about as hopeful as that of the traditional individual who tried to lift himself over a stone wall by pulling at the straps of his boots, unless the sloping pelvis was first made level.

I also wish to call attention to the light which these cases throw on the etiology of lateral curvature, though

I have no time to develop this subject here. Dr. C. Fayette Taylor estimates that half the cases of lateral curvature, as met with in his practice, occur with a sloping pelvis. In these cases, certainly, the primary curve is in the lumbar region, and he believes this to be equally true of all ordinary cases.

Does not the large preponderance, in the table, of instances where the slope is to the left, explain, partially at least, the long-recognized fact that in the majority of cases of lateral curvature the convexity of the dorsal curve is to the right, the lumbar to the left?

